

REMARKS

This amendment is responsive to the Advisory Action of March 31, 2010. Reconsideration and allowance of claims 1-4 and 8-20 are requested.

The Office Action

Claims 10, 15, 18, and 19 fails to meet the 35 U.S.C. § 112, second paragraph.

Claim 9 stands rejected under 35 U.S.C. § 101.

Claims 1-4, 8-12, 14-16, and 19-20 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Wu ("Computing Parametric Geon Descriptions of 3D Multi-part Objects", Thesis, 1996) in view of Holten-Lund et al. (VRML Visualization in a Surgery Planning and Diagnosis Application, in Proc. VRML, 2000).

Claims 13 and 17 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Wu in view of Holten-Lund et al. and in further view of Pelletier et al. (US 6,560,476).

Claim 18 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Wu in view of Holten-Lund et al. and in further view of Frisken et al. (US 6,396,492).

The Present Application

The present application is directed to determining geometrical properties of an anatomical object and extracting a measuring therefrom. A deformable surface model of a training object is generated and extended with addition geometrical information. The extended deformable surface model is adapted to a surface of an object of interest. The geometrical properties of the adapted extended surface model are determined and a measurement of interest of a structure of the object of interest is extracted.

The References of Record

Wu discloses a method for describing 3D objects by fitting parametric geons to parts of the 3D object and optimizing the fit by minimizing a fitting residual.

Holten-Lund et al. discloses a method for fitting an iso-surface to an anatomical feature. Primitives are approximated based on the fitted iso-surface and then quantified to measure the topology of the anatomical feature.

The Present Amendment

The Examiner is directed to page 6, lines 1-2; page 7, lines 12-18; page 7, lines 27-29; page 8, lines 16-31; page 9, lines 1-14; and page 10, lines 14-16 of the specification for support of the present amendment to Claims 1, 8, 9, 10.

The Examiner is directed to page 7, lines 12-18 add page 6, lines 24-26 of the specification for support of the present amendment to Claims 2, 11, 15.

The Examiner is directed to page 10, lines 10-14 of the specification for support of the present amendment to Claims 3 and 4.

The Examiner is directed to page 10, lines 26-30 and page 11, lines 1-28 of the specification for support of the present amendment to Claim 21.

Claim 9 has been amended to meet the requirements of 35 U.S.C. § 101.

Claim 10, 15, and 18 has been amended to meet the requirements of 35 U.S.C. § 112, second paragraph.

Newly added claims 21-24 further define the claims of the present application.

The Claims Distinguish Patentably Over the References of Record

Claims 1-4 and 8-20 Are Not Obvious Over Wu In View Of Holten Lund et al.

Claim 1, as amended, calls for a method for determining geometrical properties of a structure of an object of interest displayed in an image and extracting a measurement therefrom. The method includes generating a deformable model of a training object and extending the deformable model with additional geometrical information. The extended deformable model is then adapted to the surface of the object of interest such that a one-to-one correspondence is maintained. Geometrical properties of a structure of the object of interest are determined from the adapted surface model, and a measurement is extracted from the determined geometrical properties.

Without conceding the propriety of the Examiner's characterization of the Wu adapted models in combination with Holten-Lund measurement, the Applicants respectfully submit that Wu and Holten-Lund, alone or in combination, do not disclose and cannot teach the claimed training object of Claim 1, as presently amended. Both Wu and Holten-Lund, as admitted by the Examiner, disclose creating a surface model of the object of interest, rather than a training model. Accordingly, the references also do not disclose or suggest "generating an extended deformable surface model of the training object" or more importantly "adapting the extended deformable surface model [of the training object] to a surface of the object of interest". The advantage of generating an extended deformable surface model of the training model is that the additional geometric information, e.g. type of sub-part label, type of geometric primitive, and fitting method, is readily available when adapting the extended deformable model to an object of interest. Additionally, having an extended surface model ready for adaptation to an object of interest obviates the need for a clinician to manually identify the sub-parts of the object of interest due to the one-to-one point correspondence maintained. Furthermore, having the surface elements, e.g. triangles of a mesh, labeled with the additional available geometric information, a geometric primitive can be fitted to the mesh elements corresponding to the respective sub-part. Thus, computational time is improved and computational cost is reduced.

For example, having generated an extended deformable surface model of a training femur, i.e. a generic femur shaped training object, the extended surface model can be available for adaptation to a multitude of femurs of various patients. Since a one-to-one point correspondence is maintained, the determination of geometrical properties and extraction of a measurement is drastically improved because of the additional geometric information being available.

For the reasons set forth above, it is submitted that Wu as modified by Holten-Lund fails to teach all of the features of the Applicants' invention; therefore, does not render **claim 1** unpatentable. Applicants submit that the subject application is patently distinguished from the cited prior art and respectfully request the rejection of claim 1 be withdrawn. Accordingly, it is submitted that **claims 2-4, 15, 18, and 21 dependent therefrom** distinguish patentably and over the references of record.

Claim 8, as amended, calls for an imaging processing device which includes a memory for storing a training model and an image of a bone and sub-parts of the bone, a shaft and an end of the bone. The device includes an image processor for determining geometrical properties of the sub-parts of the bone and is programmed to perform the method of generating a deformable model of a training object and extended the deformable model with additional geometrical information. The extended deformable model is adapted to the surface of the object of interest such that a one-to-one correspondence is maintained between the extended deformable surface model of the training object and the adapted extended deformable surface model of the bone. Geometrical properties of the sub-parts of the bone are determined from the adapted surface model, and a measurement is extracted from the determined geometrical properties.

Without conceding the propriety of the Examiner's characterization of the Wu adapted models in combination with Holten-Lund measurement, the Applicants respectfully submit that Wu and Holten-Lund, alone or in combination, do not disclose and cannot teach the training object of **Claim 8**, as presently amended. Both Wu and Holten-Lund, as admitted by the Examiner, disclose creating a surface model of the object of interest, rather than a training model. The advantage of generating an extended deformable surface model of the training model is that the additional geometric information, i.e. type of sub-part label, type of geometric primitive, and fitting method, is readily available when adapting the extended deformable model to an object of interest. Additionally, having an extended surface model ready for adaptation to an object of interest obviates the need for a clinician to manually identify the sub-parts of the object of interest due to the one-to-one point correspondence maintained. Furthermore, having the surface elements, e.g. triangles of a mesh, labeled with the additional geometric information available, a geometric primitive can be fitted to the mesh elements corresponding to the respective sub-part. Thus, improving computational time and reducing computational cost.

For example, having generated an extended deformable surface model of a training femur, i.e. a generic femur shaped training object, the extended surface model can be available for adaptation to a multitude of femurs of various patients.

Since a one-to-one point correspondence is maintained, the determination of geometrical properties and extraction of a measurement is drastically improved because of the additional geometric information being available.

Accordingly, it is submitted that **claim 8** distinguishes patentably and over the references of record.

Claim 9, as amended, calls for a non-transitory computer-readable medium having processor instructions for controlling a processor to perform the steps of determining geometrical properties of an object. The steps include generating a deformable model of a training object and extended the deformable model with additional geometrical information. The extended deformable model is adapted to the surface of the object of interest such that a one-to-one correspondence is maintained. Geometrical properties of a structure of the object of interest are determined from the adapted surface model, and a measurement is extracted from the determined geometrical properties.

Without conceding the propriety of the Examiner's characterization of the Wu adapted models in combination with Holten-Lund measurement, the Applicants respectfully submit that Wu and Holten-Lund, alone or in combination, do not disclose and cannot teach the training object of **Claim 9**, as presently amended. Both Wu and Holten-Lund, as admitted by the Examiner, disclose creating a surface model of the object of interest, rather than a training model. The advantage of generating an extended deformable surface model of the training model is that the additional geometric information, i.e. type of sub-part label, type of geometric primitive, and fitting method, is readily available when adapting the extended deformable model to an object of interest. Additionally, having an extended surface model ready for adaptation to an object of interest obviates the need for a clinician to manually identify the sub-parts of the object of interest due to the one-to-one point correspondence maintained. Furthermore, having the surface elements, e.g. triangles of a mesh, labeled with the additional geometric information available, a geometric primitive can be fitted to the mesh elements corresponding to the respective sub-part. Thus, improving computational time and reducing computational cost.

For example, having generated an extended deformable surface model of a training femur, i.e. a generic femur shaped training object, the extended surface model can be available for adaptation to a multitude of femurs of various patients. Since a one-to-one point correspondence is maintained, the determination of geometrical properties and extraction of a measurement is drastically improved because of the additional geometric information being available.

Accordingly, it is submitted that **claim 9** distinguishes patentably and over the references of record.

Claim 10 calls for a method for determining geometric properties of a subpart of an object. The method includes, with a processor, generating a deformable surface model of a training object. With a processor, extending the deformable surface model with additional geometric information. With a processor, deforming the extended surface model to optimally fit at least one subpart of the object of interest. With a processor, determining geometric properties of the object of interest based on the deformed extended surface model and the additional geometric information.

Without conceding the propriety of the Examiner's characterization of the Wu adapted models in combination with Holten-Lund measurement, the Applicants respectfully submit that Wu and Holten-Lund, alone or in combination, do not disclose and cannot teach the training object of **Claim 10**, as presently amended. Both Wu and Holten-Lund, as admitted by the Examiner, disclose creating a surface model of the object of interest, rather than a training model. The advantage of generating an extended deformable surface model of the training model is that the additional geometric information, i.e. type of sub-part label, type of geometric primitive, and fitting method, is readily available when adapting the extended deformable model to an object of interest. Additionally, having an extended surface model ready for adaptation to an object of interest obviates the need for a clinician to manually identify the sub-parts of the object of interest due to the one-to-one point correspondence maintained. Furthermore, having the surface elements, e.g. triangles of a mesh, labeled with the additional geometric information available, a geometric primitive can be fitted to the mesh elements corresponding to the respective sub-part. Thus, improving computational time and reducing computational cost.

For example, having generated an extended deformable surface model of a training femur, i.e. a generic femur shaped training object, the extended surface model can be available for adaptation to a multitude of femurs of various patients. Since a one-to-one point correspondence is maintained, the determination of geometrical properties and extraction of a measurement is drastically improved because of the additional geometric information being available.

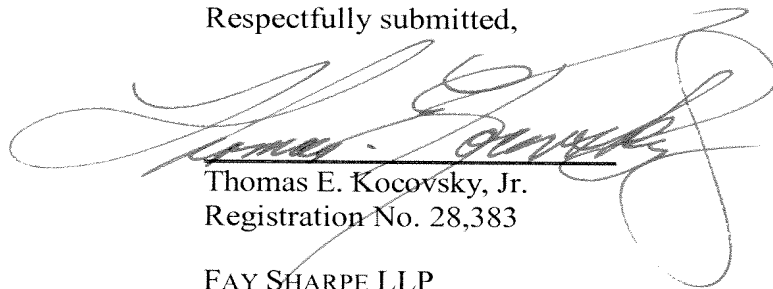
For the reasons set forth above, it is submitted that Wu in view of Holten-Lund fails to teach all of the features of the Applicants' invention; therefore, does not anticipate **claim 10**. Applicants submit that the subject application is patently distinguished from the cited prior art and respectfully request the rejection of claim 10 be withdrawn. Accordingly, it is submitted that **claims 11-14 dependent therefrom** distinguish patentably and over the references of record.

CONCLUSION

For the reasons set forth above, it is submitted that claims 1-4 and 8-20 distinguish patentably over the references of record and meet all statutory requirements. An early allowance of all claims is requested.

In the event the Examiner considers personal contact advantageous to the disposition of this case, the Examiner is requested to telephone Thomas E. Kocovsky at 216.363.9000.

Respectfully submitted,



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